





# Relationship Between Pre-Pregnancy Body Mass Index (BMI), Number of Pregnancies, and Number of Nutrition Education Participation with Circumference Upper Arm (LILA) of Pregnant Women

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## Abstract

Pregnant women's nutritional condition is determined by their Mid-Upper Arm Circumference (MUAC), which measures the body's state of balance. Factors influencing pregnant women's nutritional status include a history of body mass index before pregnancy, the number of pregnancies, and the number of participations in nutrition education. This study sought to discover the link between the history of body mass index before pregnancy, the number of pregnancies, and the number of participations in nutrition education with Mid- Upper Arm Circumference (MUAC) of pregnant women in the Working Area of the Tanjung Bintang Inpatient Public Health Center in 2022. The type of research is observational, analytic design, and cross-sectional, conducted from November to December 2022. The population in the study was 286, and the total sample was 80 respondents using the basic method of random sampling. The instrument used is a questionnaire. The data analysis used is the Spearman Correlation test. The results showed that the average Mid- Upper Arm Circumference (MUAC) of pregnant women was 25.54 with a standard deviation of 3.01, the average respondent's history of BMI was 22.272 kg/m<sup>2</sup>, the average number of respondents' pregnancies was 2.31 times, the average participation in nutrition education respondents as much as 2.93 times. The data analysis results showed a relationship between body mass index ( $p=0.0001$ ) and the number of pregnancies ( $p=0.004$ ) with the Mid- Upper Arm Circumference (MUAC) of pregnant women. There was no correlation between the number of participants in nutrition education ( $p=0.698$ ) and the Mid-Upper Arm Circumference (MUAC) of pregnant women. It is hoped that the results of this study can add to knowledge about the relationship between the history of body mass index before pregnancy, the number of pregnancies, and the number of participants in nutrition education with MUAC for pregnant women.

## A. Introduction

The nutritional state of expectant mothers provides insight into the health of the mother. The quality of the fetus or newborn that is born depends on the nutritional status of the pregnant women. Pregnant women's bodies are in a balanced state when it comes to nutrition between the intake of eating habits and nutrient

utilization used by the body for survival in maintaining organ functions. The upper arm circumference (LILA) can be used to assess a pregnant woman's nutritional health. The LILA measurement is fairly representative, with pregnant women's LILA sizes highly correlated with their BMIs—that is, the higher the mother's BMI, the larger the LILA of the pregnant woman (Hidayati, 2011).

Chronic energy deficiency can cause risk factors both during pregnancy and in the baby who is born. Risk factors that can occur include anemia, bleeding during labor, fetal death, prematurity, low birth weight (LBW), congenital defects, stunting, neonatal death (Handayani, 2014).

Research by Suhardi & Fadila (2016) demonstrates that pregnant women who have a persistent energy deficit are 2.92 times most likely to develop anemia than expectant mothers who have a healthy nutritional status. Another study that Mayanda (2017) presented showed that the chance of chronic energy deficiency was most dominant at 5.271 times the effect on low birth weight in relation to pregnant women's weight growth.

Pregnant women who have SEZ are more common nationwide than 17.3%, in Lampung Province it was 13.62%, while in South Lampung District it was 9.56% (Kemenkes RI, 2019). Based on the annual report of the Tanjung Bintang Inpatient Health Center, the prevalence of pregnant women with SEZ has increased every year. In 2019 the prevalence of pregnant women with SEZ was 3%, in 2020 it was 4.3% and in 2021 it was 6%. This shows a negative trend, although relatively smaller than the provincial and district prevalence, nutritional problems in pregnant women are very important to be addressed and considered immediately because 1000 HPK determines the future growth and development of children. Pregnant women who are exposed to SEZ may experience low birth weight, miscarriages, abortions, and decreased fetal growth (Simbolon et al., 2018).

Pregnant women's nutritional condition is impacted by various factors. including nutritional intake, infectious diseases, maternal age, economic status, ANC visits, maternal education, pregnancy distance and number of pregnancies (Teguh et al., 2019). According to research by Novita et al (2021), there is a connection between pregnant women's total number of pregnancies and SEZ. In his investigation, Faozi (2022) also mentioned that there was a relationship between the number of pregnancies with the incidence of SEZ of 92% with a high number of pregnancies experiencing SEZ out of 25 respondents. Mothers who often give birth cause low nutritional status because the recovery of maternal health after childbirth is not optimal so that nutritional status problems occur in pregnant women (Sumini, 2018).

Pre-pregnancy nutritional history can be seen from the nutritional status when the mother was pregnant. The risk of SEZ in pregnant women results from inadequate energy intake over a long period of time before pregnancy. This is due to the availability of energy that is less than the needs so that the body uses fat reserves as energy. However, if fat is continuously used, it will use protein reserves in the liver and muscles then converted into energy so that muscle depletion occurs which causes SEVERITY in pregnant women (Petrika et al., 2016). Research conducted by Alza (2018) indicates that there is a connection between a pregnant woman's risk of SEZ and her poor energy intake. Mufidah et al (2016) in her research also mentioned that pregnant women with insufficient intake have a 14.78 times risk of experiencing SEZ compared to adequate energy intake.

Efforts to improve the nutritional status of pregnant women include increasing the knowledge of pregnant women about nutrition by providing education to pregnant women. Mothers with good knowledge about nutrition will have an impact on good attitudes and behavior in determining the selection of balanced nutritional intake so that it will affect the nutritional status of the mother (Olsa et al., 2018). According to Ekayanthi & Suryani (2019) by providing education to pregnant women, it will improve the mother's skills on how to prepare the right food and nutritional arrangements during pregnancy so that It will affect how well-nourished expectant mothers are.

Tanjung Bintang Inpatient Health Center has a pregnant woman class program in 2019 which is intended as a means of learning together, discussion and education about health around pregnancy. This pregnant woman class is an integrated activity across programs, one of which is the nutrition program so that there is an implementation of nutrition education activities that aim to better educate expectant mothers in meeting nutritional intake needs during pregnancy, so it is hoped that this nutrition education activity can improve the nutritional status of pregnant women.

Preliminary studies conducted by researchers on October 07, 2022 on 10 pregnant women in the Tanjung Bintang Inpatient Health Center work area. The results obtained were 40% of pregnant women with more than 3 pregnancies experiencing SEZ and 60% with a history of poor nutritional status experiencing SEZ,

and 50% of pregnant women who did not participate in nutrition education activities during pregnancy also experienced SEZ.

Given the foregoing context, the researcher is eager to investigate the connection between body mass index (BMI) before to pregnancy, the quantity of pregnancies, and the quantity of engagement in.

## B. Research Methods

This type of research is observational research with an analytic design. The purpose of this study was to determine the relationship between the history of body mass index (imt) before pregnancy, the number of pregnancies, and the number of participation in nutrition education with pregnant women's upper arm circumference (lila) in the Tanjung Bintang inpatient health center's working area in 2022. The Ethics Commission of the Poltekkes Kemenkes Tanjungkarang granted permission for this study, including number: 321/KEPK-TJK/XI/2022. The implementation time was in November - December 2022. pregnant women with a total of 286 pregnant women at the Tanjung Bintang Inpatient Health Center. The sample in this study used 80 pregnant women.

Primary data includes data on respondent characteristics including identity, age, education and lila of pregnant women. While measurements using Seca brand anthropometry with an accuracy of 0.1 cm, Lila tape with an accuracy of 0.1 cm, Informed Consent and Questionnaires regarding the characteristics of respondents, history of body mass index, number of pregnancies, number of participation in nutrition education. The data obtained were then analyzed univariately, normality test and bivariate. Univariate data were presented in the form of percentages (%) while bivariate The statistical test of Spearman correlation was used to assess the data.

## C. Result and Discussion

### *Respondent Characteristics*

**Table 1.** Distribution of Respondent Characteristics

Characteristics	Number (n)	Percentage (%)
<b>Age (Years)</b>		
17 – 20	8	10
21 – 25	25	31,3
26 – 30	23	28,7
31 – 35	16	20
36 -41	8	10
<b>Total</b>	<b>80</b>	<b>100</b>
<b>Education</b>		
SD	10	12,5
SMP	20	25
SMA/SMK	49	61,3
S1	1	1,3
<b>Total</b>	<b>80</b>	<b>100</b>

Based on table 1 above, we can know the vulnerable age of pregnant women 17-20 years as many as 8 (10%) respondents, 21-25 as many as 25 (31.3%) respondents, 25-30 as many as 23 (28.7%) respondents, 31-35 as many as 16 (20%) respondents, 36-41 as many as 8 (10%) respondents. Thus it can be seen that most of the ages of pregnant women are in the age range of 21-25 years, but there are pregnant women who are under the age of 17 years. In addition, the education of pregnant women in the Tanjung Bintang Inpatient Health Center working area is elementary school as many as 10 (12.5%) respondents, junior high school 20 (25%) respondents, high school / vocational / high school as many as 49 people (61.3%) respondents, and S1 as many as 1 (1.3%) respondents. Thus it can be seen that most of the education of pregnant women is high school / vocational school education.

**Table 2.** Variable Mean Distribution

Variables	Mean	Median	Min	Max	SD
Lila	25,549	25,500	19,7	33,5	3,0117
IMT	22,272	21,185	15,4	33,6	4,1262

Variables	Mean	Median	Min	Max	SD
Number of Pregnancies	2,31	2,00	1	5	0,936
Total Education	2,93	2,00	1	7	1,636

Based on table 2 after the normality test with the Kolmogorof-Smirnov test, the Upper Arm Circumference (LILA) variable is normally distributed with a p value of 0.200. In this study, most respondents had normal nutritional status as many as 61 (76.3%) respondents. The average respondent's Upper Arm Circumference (LILA) variable is 25.549 with a median of 25.500, a minimum value of 19.7, a maximum value of 33.5 and a standard deviation of 3.0117.

Based on table 4.2, the IMT variable is not normally distributed with a p value of 0.013 ( $> 0.05$ ), the IMT of the respondents is mostly at 18.5 - 25kg/m<sup>2</sup> as many as 50 (62.5%) the mean Body Mass Index (IMT) of respondents is 22.272 kg/m<sup>2</sup> with a median of 21.185 kg/m<sup>2</sup>, a minimum value of 15.4 kg/m<sup>2</sup>, a maximum value of 33.6 kg/m<sup>2</sup> and a standard deviation of 4.1262.

Based on table 4.2, the variable number of pregnancies is not normally distributed with a p value of 0.001 in this study the most respondents had 2 pregnancies as many as 34 (42.5%) respondents. The average number of pregnancies of respondents was 2.31 with a median of 2.00, a minimum value of 1 maximum value of 5 and a standard deviation of 0.936.

Based on table 4.2, the variable of participation in nutrition education is not normally distributed with a p value of 0.001. in this study, the most respondents attended nutrition education 2 times with 29 respondents (36.3%). The average number of respondents' education is 2.93 with a median of 2.00, a minimum value of 1 maximum value of 7 and a standard deviation of 1.636.

**Table 3.** Statistical Test Result

Variables (x)	Variables (y)	<i>P Value</i>	<i>r</i>
IMT	LILA	0,001	0,755
Number of Pregnancies	LILA	0,004	-0,318
Number of Nutrition Education	LILA	0,698	0,044

Table 3 demonstrates the substantial correlation between pregnant women's upper arm circumference (Lila) and their prenatal history of body mass index (BMI). This can be seen from the value of  $p=0.0001$  with the value of the relationship between the two variables 0.755 which means that it has a strong relationship. and the direction of the relationship is positive. The greater the BMI, the greater the LILA.

This study shows that from Based on table 4.3, it can be seen that there is a relationship between BMI history before pregnancy with upper arm circumference with a p value of 0.0001 with a correlation value of 0.755 which means that there is a strong relationship between the two variables.

The results of this study are in line with several previous studies, namely research by [Muslimah \(2016\)](#) which states that there is a close relationship between BMI and upper arm circumference in first trimester pregnant women. This study is also in line with the research of Harjanti and Ninik (2016) who examined the sensitivity between BMI and LiLA in pregnant women stating that every one kilo gram increase in body weight will change the increase in BMI by 0.923 and LiLA by 0.001 so that if the history before pregnancy is normal BMI then LiLA will also be normal. Another study conducted by Lestari (2021) stated that the nutritional status of pregnant women is a risk factor for SEZ in pregnant women. Pregnant women who have BMI before pregnancy  $<18.5$  have a 53.7 times greater risk of experiencing SEZ than pregnant women who have BMI  $\geq 18.5$  before pregnancy.

Preconception BMI is closely related to BMI at conception because to change nutritional status requires a long time and serious treatment. Entering the pregnancy phase there are physical and mental changes that are natural, prospective mothers must be healthy and have adequate nutrition before and after childbirth, must have regular and nutritious eating habits. If the nutritional intake in pregnancy is lacking, it will affect the nutritional status of pregnant ([Sibagariang, 2010](#)). SEZ arises from an imbalance in energy intake over a long period of time. When women of childbearing age (WUS) experience SEZ and continue into the pregnancy phase, there will be many problems that can be caused. Nutritional status before pregnancy affects fetal growth and weight gain during pregnancy ([Ningrum & Cahyaningrum, 2018](#)).

Based on the researcher's assumption that the body mass index before pregnancy is below normal, it will affect the upper arm circumference of pregnant women will be below normal limits, according to the results of research on pregnant women at the Tanjung Bintang Inpatient Health Center, most pregnant women who experience chronic energy deficiency are preceded by a history of body mass index before pregnancy below normal limits. This is in line with the theory that SEZ in pregnant women is caused by insufficient energy intake. To confirm SEZ in pregnant women, body mass index in the first trimester or prenatal BMI is used.

Based on table 3, it is known that there is a relationship between the number of pregnancies with upper arm circumference with a p value = 0.004 with a regression value of -0.318, which means that the direction of the relationship between the two variables is negative so that the greater the number of pregnancies, the smaller the upper arm circumference value. This investigation aligns with the findings of [Novita et al \(2021\)](#) which states that there is a relationship between the number of pregnancies of pregnant women and SEZ with the results of univariate analysis showing that mothers who have a high number of pregnancies (>3 times) experience severe SEZ. Mothers who often give birth cause low maternal nutritional status because the recovery of maternal health after childbirth is not optimal ([Sumini, 2018](#)). This study is also in line with research conducted by [Faozi \(2022\)](#) which states that there is a relationship between the number of pregnancies with the incidence of SEZ of 92% with a high number of pregnancies experiencing SEZ from 25 respondents. Research by [Renjani & Misra \(2017\)](#) also states that pregnant women with risky parity (> 4) have a 6 times greater risk of becoming pregnant women with SEZ. The number of pregnancies or the number of children born by a mother's body needs time for the recovery process, before the recovery is complete, she has experienced pregnancy again, this is what causes pregnant women not to focus on choosing good food which results in inappropriate food intake.

The risk of SEZ is a manifestation of macronutrient problems when it occurs in women of childbearing age and pregnant women. Macronutrient problems are problems that are mainly caused by deficiencies or imbalances in energy and protein intake. The number of pregnancies affects the condition of chronic energy deficiency in pregnant women with measurement indicators using upper arm circumference. Chronic energy deficiency in pregnant women is a problem often experienced by pregnant women related to the nutritional status of pregnant women. Chronic or long-term energy deficiency is a pregnant woman who experiences a lack of nutrients, especially from food, which can cause health problems for the mother ([Alamsyah, 2013](#)).

Based on table 4.3, it is known that there is no significant relationship between the number of participation in nutrition education with upper arm circumference with a p value = 0.044 and a regression value of 0.004 which means that the relationship between the two variables is very weak. This study is in line with research conducted by [Kartikasari et al \(2012\)](#) which states that there is no significant relationship between education and the nutritional status of trimester II pregnant women at the Bangetayu Health Center, Genuk District, Semarang City. Research conducted by [Widyastuti & Sugiarto \(2021\)](#) also states that there is no relationship between education and the nutritional status of pregnant women who give birth to Independent Midwife Practices "Y" Indramayu Regency. This shows that good education does not necessarily have a good nutritional status. Nutritional problems occur due to ignorance or lack of information about nutrition. But if pregnant women often hear information about nutrition, it will increase the knowledge of pregnant women so that they will be well informed ([Kartikasari et al., 2012](#)).

In addition to nutrition education, economic factors also play an important role in the nutritional status of pregnant women. Although the mother's knowledge about nutrition is good but the family's income is low, the purchasing power or food availability in the family is deficient ([Najoan & Manampiring, 2011](#)). Research of [Rahayu & Sagita \(2019\)](#) states that there is a relationship between income and the incidence of SEZ. Low family income causes people to be unable to buy food to meet their needs. So that income is very influential in the purchasing power of the family.

These results are not in line with the theory which states that nutrition education is a means of information related to nutrition that can increase knowledge with the hope of changing attitudes and habits on a balanced nutritional diet so as to prevent nutritional problems. Knowledge about pregnancy nutrition is very important for the fulfillment of nutrition during pregnancy. For pregnant women, nutritional needs are not only for themselves but also for the fetus they are carrying. Pregnant women who meet their dietary demands properly will also ensure that the fetus's nutritional needs are satisfied, allowing for optimal growth and development of the fetus inside the womb ([Elfiyah et al., 2021](#)).

Based on the researcher's assumption, the absence of a relationship between the variable of education participation and the upper arm circumference of pregnant women when viewed from the data on the

characteristics of pregnant women may be caused by the average education of high school / vocational / high school pregnant women 49 people (61.3%) with an age of 21-25 years as many as 25 people (31.3%). The education and age of pregnant women have recognized social media so that mothers feel nutrition education activities are considered less important because mothers feel they can be more active in finding information about pregnancy both about nutrition education through social media. However, there are several other factors that influence the delivery of nutrition education material, namely the atmosphere is not conducive where pregnant women do not focus on listening to the material presented.

#### D. Conclusion

The mean Upper Arm Circumference (LILA) of the respondents was 25.59 with a standard deviation of 3.01. The median BMI of the respondents was 21.185 kg/m<sup>2</sup> with a standard deviation of 4.1262. The median number of pregnancies of the respondents was 2 with a standard deviation of 0.936. The median number of respondents' education participation was 2 with a standard deviation of 1.636. There is a significant relationship between BMI history before pregnancy and upper arm circumference of pregnant women with a p value = 0.0001 with r = 0.755. There was a significant relationship between the number of pregnancies and upper arm circumference of pregnant women with a p value = 0.004 with r = -0.318. Pregnant women's upper arm circumference and involvement in nutrition education did not significantly correlate with a p value = 0.044 with r = 0.044.

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